

A CAUSAL RELATIONSHIP BETWEEN PUBLIC EXPENDITURE EDUCATION AND HUMAN DEVELOPMENT: ANALYSIS OF INDIAN STATES

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Abstract

This article evaluates the causal relationship between public expenditure on education and human development by implying the regression analysis on the Human Development Index and education expenditure at the state level. The study is relying on secondary data collected through various government sources. The result of the study shows that there is a positive relationship between education expenditure and human development and it is statistically significant. The study also found that the fastest-growing states which classified in a high-level income group spend less on education whereas the least developed states improve their spending in the education sector. The causal relationship explains that one per cent increase in education expenditure leads to an increase in HDI by 64%.

Keywords: Human Development Index, Public expenditure on education, Education, health and standard of living, causal relationship, regression

INTRODUCTION

Human development index is a key to measure the growth of human development. Every year the United Nation Development Programme (UNDP) publishes a human development report. HDR received so much reflective attention on some solitary and traditional measure of economic progress which involves a systematic examination of a wealth of human beings. According to HDR India ranked 129 among 189 countries (HDR, 2018) and categorized in medium human development on the basis of statistics composite indices – life expectancy, education and per capita income. These indicators bring the inescapably pluralistic concept of progress and are classified as high level, medium level and low-level HDI. A high HDI is used as a means of aggrandizement, whereas a low HDI reflects national insufficiency (Chaurasia, 2018 &19). A high or low-level HDI is depending upon the three key dimensions that are Health, Education and economic growth (per capita NSDP) and these indicators are influenced by the public expenditure. Public expenditure on these dimensions indicates the priority given by the government for the improvement of the standard of living and it helps in the growth of an economic (Aggrawal, (2015); Patel (2019); & Mukherjee (2014). A few studies (UNDP 2013, Gupta 1998) suggested that public expenditure, especially in health, education and sectors, contributes positively to human development. Similar studies are conducted by Razmi (2012), Agrawal (2015), Imide (2014), Edeme (2014) & Patel (2019) and the evidence from these studies state that there is a positive interconnection between health expenditure and education expenditure on human development. The empirical pieces of evidence state that there is a spillover effect of education expenditure and health expenditure. The public spending on health affects education outcomes and public spending on education affects health outcomes and vice-versa (Agrawal, 2015). So, the public expenditure on education and health is duly important as other sectors. The framework of endogenous growth theory holds that investment in an endogenous variable such as human capital, knowledge and innovation significantly contributes to economic growth (Liberto, 2020). The endogenous growth theory propounded by the (Lucas, 1988), (Romer, 1990) and Barro (1991) emphasizes how education acts as a mechanism in economic growth. Therefore, it is stated that education is a crucial factor for human resource development and the essence of public expenditure on education is to curb negative externalities and improve economic growth (Edeme 2014). The confinement of literature received remarkable acceptance among economists and policymakers across the world that the investment in education improves human development and helps in to achieve sustainable development of the economy (Patel, 2019).

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LITERATURE REVIEW

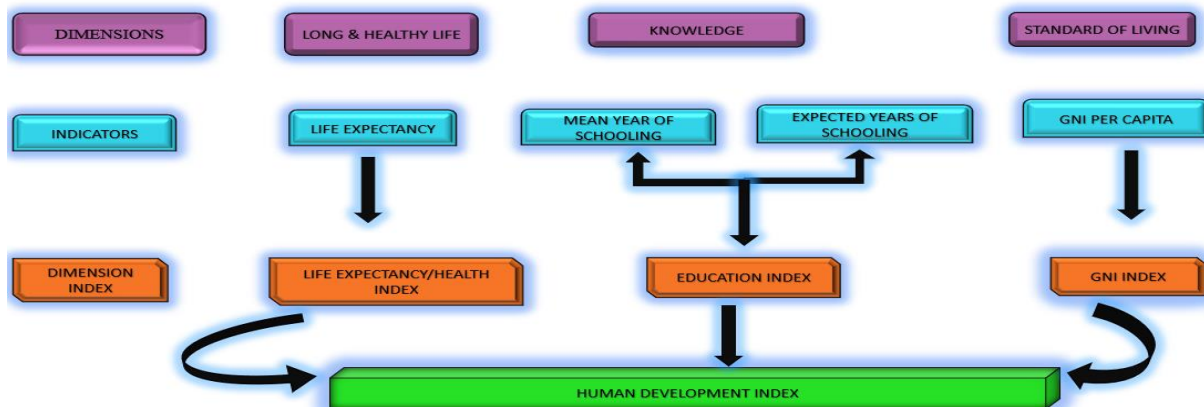
Several studies in India evaluate the impact of public education expenditure on human development. A study by (Bhanumurthy, 2016) examines the linkages between the quality of governance, public expenditure and human development. Patel (2019) used the granger causality test to examine the causal relationship between public education expenditure and HDI. The study found the temporal causal relationship and public expenditure is considered to be endogenous of HDI. Some research evidences the efficiency of government spending on education and health. One of the researches conducted by the (Prsetyo, 2013) has investigated the efficiency level of government expenditure in 81 countries. The study estimates the relationship between public expenditure and HD by considering the health and education sector as input and HD as output. He found that those countries who efficiently do the public expenditure on health and education manage to maintain the high-level HDI then the less efficient countries and they are listed in the efficient frontiers. Edeme (2014) conducted a study on the distributional impact of public expenditure on education, health, agriculture, rural development, energy, housing, environmental protection and water resources on HD in Nigeria. The panel estimation results suggest that the effect of sectoral changes in public expenditure varies on HD consideration. The education, health, agriculture, rural development and water resources have a positive impact whereas energy, housing and environmental protection has decreasing the marginal impact of HD. He recommended that to improve human development, expenditure on education, health, agriculture, rural development and water resources should be sustainable. Mallick, Das and Prdhan (2016) estimated the regression equation model to know the impact of education expenditure on economic growth in 14 major Asian countries Bangladesh, China, Hong Kong, India, Japan, Malaysia, Nepal, Pakistan, The Philippines, Saudi Arabia, Singapore, Sri Lanka, Thailand, and Turkey from 1973-2012. By using unidirectional Granger causality they observed a long relationship exist between education expenditure and economic growth. The above literature implied that the variables such as expenditure on education, health and social sector are the most powerful weapons for the improvement in Human Development, whereas the government mechanism plays a key role in strengthening economic growth and human development. There are several studies conducted at the regional level which evidence the variations in human development in its constituent districts. One such study conducted by Chaurasia (2018) focused on the intraregional disparities in Gujarat and he observed that human development in their respective districts shows the intraregional disparities. Mukherji (2011) analyse the interdependence between per capita income as economic growth and human development by using cross-sectional study at India level during the period 1993-2004. The result of regression analysis shows that sub-district disparities exist between the states. The rural HD elasticity has influenced economic growth more significantly than in rural areas. Another research conducted by Mukherji (2014) interpreted the state-wise HDI over the last three decades and analysed their growth pattern across 28 states in India. The regression analysis establishes a positive relationship between EG and HD. The research concluded that the states have higher per capita income, and devote more in HD.

The study is conducted to contribute to the existing literature and attempts to establish the association between the public expenditure on education with human development for the period 2011-2018 using cross-sectional data for 20 Indian states.

DATA AND METHODOLOGY

To enable cross sectional study, the HDI is calculated based on the data from the government published report and other credible sources. The HDI is computed for Indian states on the basis of three dimensions: - Knowledge, Health and standard of living. These dimensions are based on the indicators. The indicators are graphically represented as follows:

Figure 1 calculation of Human Development Index and its dimension indexes



<https://www.gapgyan.org/>

Source: Retrieve form Technical notes of Human Development Report 2019

To calculate the HDI the study uses the same goalposts as mentioned in the technical notes of UNDP 2019 and to verify the result; the methodology described in UNDP has been used for calculating the index of HDI. The report follows two steps to create the HDI. First step is to create dimension indices with the help of goalpost.

Table 1 Goalpost Table - Minimum and Maximum value for indices

Dimension	Indicator	Minimum	Maximum
Health	Life Expectancy (year)	20	85
Education	Expected years of schooling (years)	0	0
	Mean years of schooling (years)	0	0
Standard of living	Gross national income per capita (2011 PPP \$)	100	75000

Source: Retrieve from the Human Development Report 2019

The dimension indices are calculated as follows

$$I_x = \text{Dimension index of 'X'} = \frac{\text{Actual Value} - \text{Minimum Value}}{\text{Maximum Value} - \text{Minimum value}}$$

I_x represents Education, Health and per capita income.

The second step is to aggregate the dimension indices for calculating the HDI. The aggregate of the HDI is the geometric mean of the three dimensional indices which are calculated as follows:

$$HDI = \sqrt[3]{I_{Health} * I_{Education} * I_{Income}}$$

DATA SOURCE FOR THE INDEPENDENT VARIABLES

Long and Healthy life

The long and healthy life dimension is measured by the life expectancy rate. Life expectancy data is taken as an average for the period 2012–2016. This data is obtained from the Reserve Bank of India Publication - Handbook of Statistics on Indian States.

Knowledge

The knowledge is depicting the education level of the nation. The education level is used to construct the education dimension Index (EDI) and the education Index is calculated from Mean year of schooling and Expected year of schooling. To compute the education index data is derived from the human development database which is maintained by the Global data lab of the Institute of Management Research of the Radboud University, Netherlands.

Standard of Living

The standard of living of the people is measured by their purchasing power and purchasing power is approximated by per capita National State Domestic Product. The data set for Per capita NSDP (at 2011-12 series) is derived from the Ministry of Statistics and Programme Implementation (mospi). The NSDP data helps in the computation of Income Index or GNI Index.

Public Education Expenditure

Expenditure on Education - As Ratio to Aggregate Expenditure is derived from the RBI Publication - State Finances.

The study has taken the average of per capita NSDP for the preceding 7 years (2011-2018). Similarly, the average of mean year of schooling, average of years of schooling and expenditure on education is taken. The study distributes the Indian states as high, middle and low- income states with the help of quartiles. The purpose to take this data for computation of HDI is (a) it gives the current picture of HDI and (b) the availability of the data. The data of life expectancy is available for 2012-16 and per capita NSDP is available for 2011-2018 at 2011-12 base years. The Regression model is specified to compute the impact of public expenditure education as independent variable on HDI as dependent variable. The model can be described by considering the following function-

$$HDI = f(PCNSDP, EI_{EE}, Y_{EE})$$

Where, HDI = Human Development Index

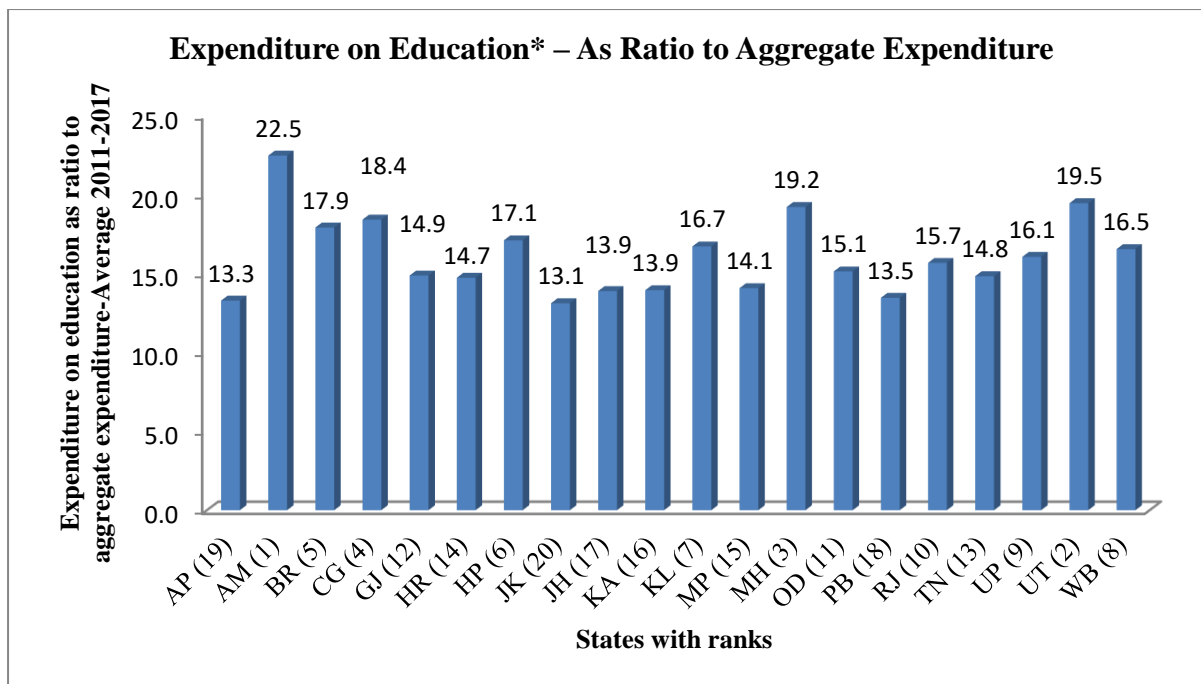
PCNSDP = Average of Per Capita National State Domestic Product at 2011-12 base year over the preceding 7 years.

EI_{EE} = Average of the 'ratio of education index to education expenditure' over the preceding years.

Y_{EE} = Average of the 'ratio of NSDP to EE' over the preceding years.

Growth of Public Expenditure on Education

Figure 1: Average of Expenditure on Education as Ratio to Aggregate Expenditure



Source: Computed from the RBI publication

The public expenditure on education as a ratio to aggregate for all the major Indian states is presented in figure 1. The numbers shown in parenthesis represent the ranks of respective states and the average education expenditure is represented on the bar chart. The public expenditure on education is the highest for Assam (1st) followed by Uttaranchal (2nd) and Maharashtra (3rd). The BIMARU states – Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh show some improvement in spending on education. But among these (BIMARU) states Bihar has shown tremendous improvement in education spending and secured 5th rank. It is surprising to note that India's most prosperous states that contribute the most to India's national income spend less on education. According to the mospi, during 2012-18 on an average Gujarat (10%), Karnataka (9.14%), Tripura (9.16%), Haryana (8.54%) had the highest growth rate and was considered to be a fastest-growing state. These states are considered the most developed states among the major states of India, whereas West Bengal (5.33%) and Chhattisgarh (5.59%) considered the slowest growing states. States such as Tamil Nadu are ranked second for contributing to India's national income, and 13th in spending on education. Similarly, Gujarat and Karnataka which are the second and third largest states are ranked 12th and 16th in education spending.

Table 1: Distribution of the major states by the level of Income and HDI

States	Health Index	Edu Index	GNI	HDI and Income level ³	Rank	Edu Exp	Rank
	1	2	3	4	5	7	8
Andhra Pradesh	0.763	0.511	0.359	0.519 (H)	11	13.33	18
Assam	0.7	0.527	0.276	0.467 (L)	18	22.83	1
Bihar	0.766	0.463	0.173	0.395 (L)	20	18.07	5
Chhattisgarh	0.695	0.504	0.318	0.481 (M)	17	18.53	4
Gujarat	0.762	0.661	0.409	0.59 (H)	1	14.72	13
Haryana	0.76	0.592	0.43	0.578 (H)	2	14.52	14
Himachal Pradesh	0.805	0.593	0.401	0.576 (H)	3	16.98	6
Jammu and Kashmir	0.823	0.579	0.303	0.524 (M)	10	13.2	20
Jharkhand	0.737	0.556	0.303	0.499 (L)	15	13.55	17
Karnataka	0.755	0.552	0.406	0.553 (H)	7	13.82	16
Kerala	0.848	0.524	0.412	0.568 (H)	4	16.55	7
Madhya Pradesh	0.698	0.67	0.274	0.504 (L)	13	14.35	15
Maharashtra	0.803	0.541	0.415	0.565 (H)	5	19.05	2
Orissa	0.732	0.56	0.305	0.5 (M)	14	14.92	11

³ Income level is computed by the author and classifies the Indian states as High (H), Middle (M) and Low (L) income states. For high level income group NSDP should higher then Q2 (73629), for middle income group, NSDP should lies between Q1 and Q2 (54100-73629) and for low income group NSDP should lies below or equal to Q1 (54100)

Punjab	0.808	0.532	0.386	0.55 (H)	9	13.23	19
Rajasthan	0.743	0.561	0.326	0.514 (M)	12	15.32	10
Tamil Nadu	0.791	0.525	0.403	0.551 (H)	8	14.92	11
Uttar Pradesh	0.689	0.55	0.236	0.447 (L)	19	15.88	9
Uttarakhand	0.792	0.536	0.42	0.563 (H)	6	19.02	3
West Bengal	0.782	0.521	0.303	0.498 (M)	16	16.12	8
ALL INDIA	0.76	0.56	0.64	0.65 (M)	129		

Source: Computed by Author

The composite index of human development is computed to examine the relative performance of 20 major Indian states is presented in table 1. The result of income level is presented in parenthesis with HDI. The abbreviations H indicate high, M- Medium and L-Low level income.

HDI as well its indicators EDI, HI, and GNI shows the disparities across the states. The states with high levels of income perform better in human development. In terms of HDI, Gujarat is the fastest-growing state and Haryana, Himachal Pradesh, Kerala and Maharashtra rank 3rd, 4th and 5th place respectively. The high-income states such as Gujarat, Haryana, Himachal Pradesh, Kerala, Maharashtra, Uttarakhand and Punjab had HDI above 0.5 whereas Bihar and Uttar Pradesh had HDI below 0.45 and other states had HDI between 0.45 and 0.55. Bihar remains at the lower rank of HDI. According to the research conducted by the Chaurasia (2019) analysis the trend for the period 1990-2018 of Indian states. From the relative rank analysis, he found that Bihar ranked lowest among the states.

Table 1 depicts 7 years of average public expenditure on education and their respective ranks. Assam is number one in terms of spending on education, followed by Maharashtra (2nd), Uttarakhand (3rd), Chhattisgarh (4th) and Bihar (5th). It is surprising to see that Assam and Bihar, which are seen as low-income states, are doing well in terms of spending on education, whereas those states (excluding Maharashtra) who perform better in terms of per capita and HDI, they spend less on education. Maharashtra has been able to maintain its place in the top five states in HDI and education expenditure. But Gujarat and Haryana, which rank first and second in the higher income group, are ranked 13th and 14th in terms of education expenditure. The reason can be derived from the analysis is that the high-level income group states have already in the growth phase and achieve a high literacy rate and almost 100% gross enrolment rate compared to other states. The above analysis of the table depicts the variation in HDI as well as spending on education. Some states have high HDI and some have low. Similarly, spending in the education sector is differentiating among the states. The education index and health index also varies from states to states. Among the three dimensions of the human development index, the rate of health index is higher as compared to education index and GNI.

Table 2: Regression result for education index and health index

<i>Regression Statistics</i>	
Multiple R	0.787973
R Square	0.620902
Adjusted R Square	0.576302
Standard Error	0.032497
Observations	20

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	2	0.029405	0.01470227	13.92163	0.000263
Residual	17	0.017953	0.001056074		
Total	19	0.047358			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.33347	0.162809	2.048214955	0.056307
Health Index	0.716524	0.167033	4.289721698	0.000496
Edu Index	0.559135	0.153455	3.643650936	0.002009

The study used the regression analysis to find the causal relationship between the two dimensions of Human Development Index – Health Index and Education Index. The above analysis shows the independent variable - health and education index is found to be positive and statistically significantly with dependent variable - human development. The T statistics have signs consistent with a priori expectations as the coefficients of health index and education is statistically significant at 1 percent level of significance. This indicates that both the variables have a positive impact on HDI. The regression model specification is as follows

The result of above model is specified in following equation form

$$HDI = 0.33 + 0.716HI + 0.559EI$$

The specification of model results explains the positive impact of education index and health index on HDI. It explains that if the health index increases by 1 percent, the HDI increases by 0.71 point or approximately 72%. If the education index increases by 1 percent, then the HDI increases by 0.559 or approx 60%. The result indicates that health is contributing more in human development than education.

Table 3:- Contribution of education expenditure in HDI

<i>Regression Statistics</i>	
Multiple R	0.515662
R Square	0.265908
Adjusted R Square	0.225125
Standard Error	0.033644
Observations	20

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.00738	0.00738	6.520081	0.019955
Residual	18	0.020375	0.001132		
Total	19	0.027755			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.642111	0.041733	15.38632	8.42E-12
EI_EE	2.950071	1.15533	2.553445	0.019955

As mentioned above the study tries to find the causal relationship between public expenditure on education and Human development Index. The study comprises the ratio of education expenditure to education index and denoted as EI_EE. This is because the public expenditure on education incurred in the creation of educational infrastructure, improvement in literacy rate and gross enrolment rate (Shafuda 2020 and Agarwal 2015). So the study takes the ratio of education index to education expenditure to check the effect on human development. Table 3 depicts the result of regression analysis. EI_EE is an independent variable and the coefficient of HDI is found to be positively related and statistically significant despite a low R².

$$HDI = 0.642 + 2.77EI_{EE}$$

The specification of the result explains that one per cent increase in education expenditure leads to an increase in HDI by 64%. It is also argued that per capita income could also count the impact of public expenditure on human development because increase in public expenditure on education leads to increase in per capita income and tends to economic growth.

CONCLUSION

The study is conducted to find the causal relationship between educational expenditure and human development. The relationship between education expenditure and human development was found to be positive and statistically significant. The ratio of education index to educational expenditure includes that as education expenditure increases, the gross enrollment rate and literacy rate also increase. An increase in educational expenditure leads to an increase in gross enrollment and literacy which helps in the growth in the education index and an increase in the education index leads to an increase in the human development index. The study also found that people classified as relatively developed states or high-income groups spend less in the education sector. And the low-income group showed an improvement in the pattern of education expenditure. It can be analyzed that high-income income group states are already in the development stage and have higher literacy rates than other states and have a gross enrollment rate of almost 100%. This is the reason

that developed states are making education private in India rather than being good in public. According to MHRD data, the number of private schools and colleges has increased over time, as this private institution attracts students' attention. The result is that many students enrol in these private institutions. Perhaps this is why developed states spend less on education. It has been suggested that states should continue spending in the education sector if they want to maintain a sustainable Human Development Index.

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